Peer Review Report

316(b)Stated Preference Survey Report Document

(Final Submission)

Prepared by

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I. PURPOSE OF PEER REVIEW

Section 316(b) of the Clean Water Act

The U.S. Environmental Protection Agency is developing rules under Section 316(b) of the Clean Water Act (33 U.S.C. 1251 *et seq*). Section 316(b) establishes national performance requirements that are designed to minimize adverse environmental impacts caused by cooling water intake structures (CWISs). These structures negatively impact aquatic biota through impingement mortality (where fish or other aquatic life are trapped and killed on equipment at the entrance to the CWIS) and entrainment mortality (where fish and other aquatic organisms are taken into the cooling system, passed through the heat exchanger, killed, then discharged back into the source body). Additional adverse impacts on biota are associated with the operation of CWISs such as thermal discharges, chemical effluents, flow modifications and nonlethal effects of impingement caused by the plants.

Due to these lethal and nonlethal effects section 316(b) requires that CWISs minimize their adverse environmental impacts through reduction of volume, frequency and/or seasonality of water withdrawals in order to enhance ecosystem functions of affected water bodies. The EPA has developed section 316(b) rule in several phases since 2000 to address new and existing manufacturers, power plants and offshore oil and gas facilities using CWISs that withdraw over 2 million gallons of water daily from U.S. waters.

Under Executive Orders 12866 and 13563 the EPA is required to estimate the potential benefits and costs to society of rules it proposes. In order to monetize the ecological gains from the Section 316(b) rule, the EPA requested and received approval from the Office of Management and Budget to conduct a stated-preference survey that included choice questions to estimate the environmental benefits of changes in operations of CWIs. The stated preference (SP) study was designed to estimate marginal willingness to pay (WTP) for selected environmental attributes that would be affected by implementation of the rule. The use of choice questions provides an estimated valuation model that can be used for a variety of implementation procedures associated with the 316(b) rules.

Purpose and Process of the Peer Review

The purpose of this report is to present a Peer Review of the survey design and implementation, data analyses and reporting. Peer review is a process for identifying and enhancing the scientific content of a study, which will enable EPA to understand the confidence and limitations they may place on study results to support policy analyses. The EPA report and associated materials were reviewed by:

[redacted] a 2006 peer review panel that reviewed a stated-preference survey developed in 2005 to assess the environmental benefits of changes in the operations of CWIs. EPA used comments from that review to develop a new survey instrument that is being reviewed here.

The main document the reviewers were asked to focus on is entitled, "316(b) Stated Preference Survey Peer Review Document". This document includes EPA's documentation and analysis of the stated preference survey design and analysis of the resultant data. The review panel was also provided a document entitled "Summary of Public Comments on the 316(b) Stated Preference Survey," which contains the comments received during the Notice of Data Availability (NODA) public comment period and EPA responses. EPA also provided the following background documents and files to be used as a resource if additional information was necessary for reviewing EPA's methodology and results:

1. ICR supporting statement
2. Focus Groups Executive Summary Memorandum
3. All versions of the survey instrument for four regional surveys and a national survey
4. An outline of the quality assurance measures use during the implementation of the survey
5. The Stated Preference Survey NODA
6. The NODA supporting document and Memorandum
7. An Excel file including all data from the main and non-response surveys
8. The Economic and Environmental Benefits Assessment Report for the 316(b) proposed rule

There were three stages of the peer review process prior to the compilation of this peer review report. In the first stage, each member of the panel individually provided written responses to charge questions provided by the EPA. In the second stage, the written comments were shared among the panelists and each reviewer was asked to comment on the comments of other panel members. The third stage was a conference call with the peer review panel organized by Mr. Peter Chaikin. After the conference call, this peer review report was written summarizing the panelists' comments on the EPA report. This document was reviewed by the panel members before submission to the EPA. We will refer to this process as the Applied Planning Corporation peer review.

This peer review is intended to assess the work that EPA has completed to date on the 316(b) stated-preference research. The peer reviewers were asked to identify areas where modifications to EPA's estimation and validation approaches would improve the accuracy and precision of willingness-to-pay estimates.

II. SUMMARY OF EPA VALUATION STUDY

Benefit Estimation

EPA's benefit analysis for the proposed 316(b) rule includes estimates of changes in use values of commercial and recreational fisheries, and a partial estimate of changes in non-use values (USEPA 2011a).[1] Non-use values are values that people may hold for an environmental improvement that are not tied to any direct observable use of the resource such as recreational fishing.

After the proposed rule was released, EPA conducted a stated preference study to estimate total (use plus non-use) benefits to the public places of ecological improvements arising from regulating CWISs. The use of a SP survey reflects recent EPA guidelines for benefits analysis (USEPA 2010, p. 7-41) that recognize the "advantages of [stated preference] methods include[ing] their ability to estimate non-use values and to incorporate hypothetical scenarios that closely correspond to a policy case." It is this stated preference study for which this document provides a peer review.

The objectives of the SP study were to "explore how public values (including non-use values) for fish and aquatic organisms are affected by I&E mortality at cooling water intake structures (CWIS) located at existing 316(b) facilities, as reflected in individuals' willingness to pay for programs that would prevent such losses" (USEPA 2011, p. 30).

The Choice Experiment

Stated preference surveys ask individuals to make choices from which researchers elicit information to estimate individuals' values for specified changes in an environmental amenity and are typically framed in terms of estimating willingness-to-pay (WTP). WTP is the maximum amount of money that an individual or household will pay for a specified environmental change and respondents express information to estimate their WTP through choices over policy options. Advantages of choice-based questions include similarity to referenda or market choices where individuals are familiar with choosing among alternative policy options or commodities at specified costs (Freeman 2003). Carefully designed SP questions include features to reduce hypothetical and other possible biases that can result from asking survey questions versus assessing WTP through market transactions or binding referenda.

The 316(b) survey was designed as a choice experiment following established procedures (Adamowicz et al. 1998; Louviere et al. 2000; Bennett and Blamey 2001; Bateman et al. 2002). Choice experiments are a SP technique in which people's values are estimated based on their choices over a set of hypothetical alternative states defined by attribute levels which may or may not contain policy options. Respondents are presented with a set of multi-attribute alternatives and asked to select their preferred alternative. This format has been applied to assess WTP for ecological resource improvements similar to those at issue in the 316(b) policy case (e.g., Bennett and Blamey 2001; Hanley et al. 2006a, b; Hoehn et al. 2004; Johnston et al. 2002, 2011a, b; Milon and Scrogin 2006; Morrison and Bennett 2004; Morrison et al. 2002; and Opaluch et al. 1999).

[1] The Environmental and Economic Benefits Analysis (EEBA) for the proposed rule is available online at http://water.epa.gov/lawsregs/lawsguidance/cwa/316b/upload/environbenefits.pdf.

An example of a choice question used in the 316(b) Northeast survey is the following:

Question 4. Assume that Options A and B would require a different mix of filters and closed cycle cooling in different areas. Assume all types of fish are affected. How would you vote?

Policy Effect NE Waters	Current Situation (No policy)	Option A	Option B
 Commercial Fish Populations (in 3-5 Years)	42% (100% is populations that allow for maximum harvest)	45% (100% is populations that allow for maximum harvest)	48% (100% is populations that allow for maximum harvest)
 Fish Populations (all fish) (in 3-5 Years)	26% 100% is populations without human influence)	30% (100% is populations without human influence)	27% (100% is populations without human influence)
 Fish Saved per Year (Out of 1.1 billion fish lost in water intakes)	0% No change in status quo	5% <0.1 billion fish saved	5% <0.1 billion fish saved
 Condition of Aquatic Ecosystems (in 3-5 Years)	50% (100% is pristine condition)	52% (100% is pristine condition)	54% (100% is pristine condition)
$ Increase in Cost of Living for Your Household	$0 No cost increase	$48 per year ($4 per month)	$48 per year ($4 per month)
HOW WOULD YOU VOTE? (CHOOSE ONE ONLY)	☐ I would vote for NO POLICY	☐ I would vote for OPTION A	☐ I would vote for OPTION B

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Respondents considered Policy Option A, Policy Option B, and No Policy (current situation) and chose choosing the option that they preferred. The attributes and their levels in each choice option reflected a feasible outcome under alternative 316(b) regulatory scenarios. Respondents were asked to answer choice questions that differed in the levels assigned to the attributes.

This SP study was designed as a mail survey sent to households in different regions of the country and to a nationally representative sample. The target population for the SP survey was all households in each region or from the continental U.S., and respondents from each household were 18 years of age or older. Alaska and Hawaii were excluded because they include only four in-scope non-recirculating facilities, represent a small percentage of overall household population, and are separated geographically from the states in each survey region. The population of continental households was stratified into four survey regions (Northeast, Southeast, Inland, and Pacific) and each region had a version of the survey that presented attribute levels specific to it. These regions were defined by state boundaries and differed from the 316(b) benefits regions used in the Environmental and Economic Benefits Analysis (EEBA) for the proposed rule. The national survey presented attribute values for all U.S. waters. The surveys were allocated across the four regions based on the number of households in each region relative to the total number of households in the continental United States. In addition, a minimum number of completed surveys were required for each region. The survey instrument was designed to maximize the response rate and procedures were employed to identify potential non-response bias.

In July 2011, The Office of Management and Budget (OMB) approved implementation of the Northeast survey version as a pilot study to inform survey design prior to full implementation in all regions and the national sample. Implementation of the remaining survey versions was approved in November 2011. EPA mailed the survey to 7,840 households in total, and received a total of 2,313 completed surveys with an average response rate of 32% across the five sampling regions.

EPA also conducted a follow-up study of households who did not return a completed mail survey. The follow-up examined whether non-respondents answered certain questions in a statistically different way from respondents, as well as checked observable socio-demographic characteristics for statistical differences. The follow-up study included a set of key attitudinal questions and socio-demographic variables that are likely to be associated with WTP for reducing fish mortality from cooling water intake structures (CWISs) and improving fish populations and conditions in the affected aquatic ecosystems. EPA implemented the follow-up study using two subsamples: the first subsample received a paper questionnaire via priority mail and the second subsample was surveyed by telephone. Both non-response subsamples were asked the same set of attitudinal and demographic questions.

The survey sections included:

- **Relative Importance of Issues Associated with Industrial Cooling Water**. Respondents considered the relative importance of key issues associated with the use of cooling water by industrial facilities.
- **Concern for Policy Issues.** Respondents were asked questions about the relative importance of different policy issues.
- **Relative Importance of Effects.** Respondents were asked questions to promote understanding of the metrics included in the stated-preference questions.

- **Voting for Regulations to Prevent Fish Losses in the Respondent's Region (or Nationally).** The SP questions in this section were the key part of the survey asking respondents' choices when presented with specific fish-related and other ecosystem resource changes within their region at specified costs to their households.
- **Reasons for Voting "No Policy".** This question provided information used by EPA to identify protest responses; however, not all "no policy" responses are protests.
- **Respondent Certainty and Reasons for Voting.** This section is designed to identify respondents who incorrectly interpreted the choice questions or the uncertainty of outcomes.
- **Recreational Experience.** This question elicits recreational experience data to investigate if respondent characteristics influence responses to the SP choice questions.
- **Demographics.** Responses to these questions are used to estimate the influence of demographic characteristics on respondents' SP choices, and ultimately, their WTP to prevent I&E mortality losses of fish.

EPA's analysis of the 316(b) SP survey data is grounded in the random utility model of consumer choice (Hanemann, 1984; McConnell, 1990). The use of the random utility model is standard in the SP literature for attribute-based valuation exercises such as choice experiments, and allows the estimation of well-defined welfare measures (i.e., WTP). EPA used regression models (particularly the mixed logit model) based on random utility specification of choices to estimate annual household willingness-to-pay for an improvement in the environmental attribute levels included in the survey (fish saved, commercial fish populations, fish populations (all fish), and aquatic ecosystem condition). EPA used WTP as the value measure in the estimation of the regional and national benefits of the regulatory options presented in the proposed rule.

III. PEER REVIEW

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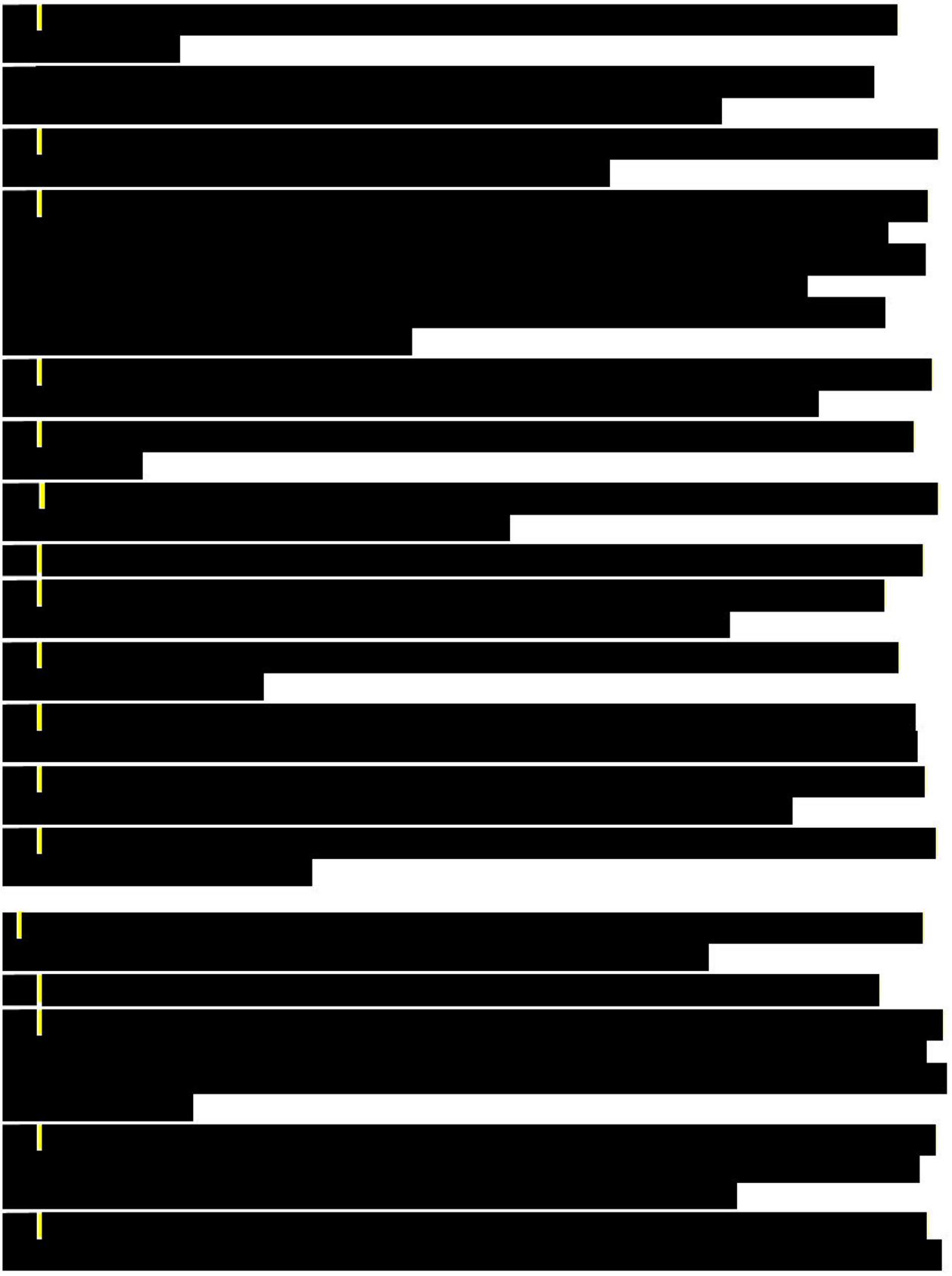

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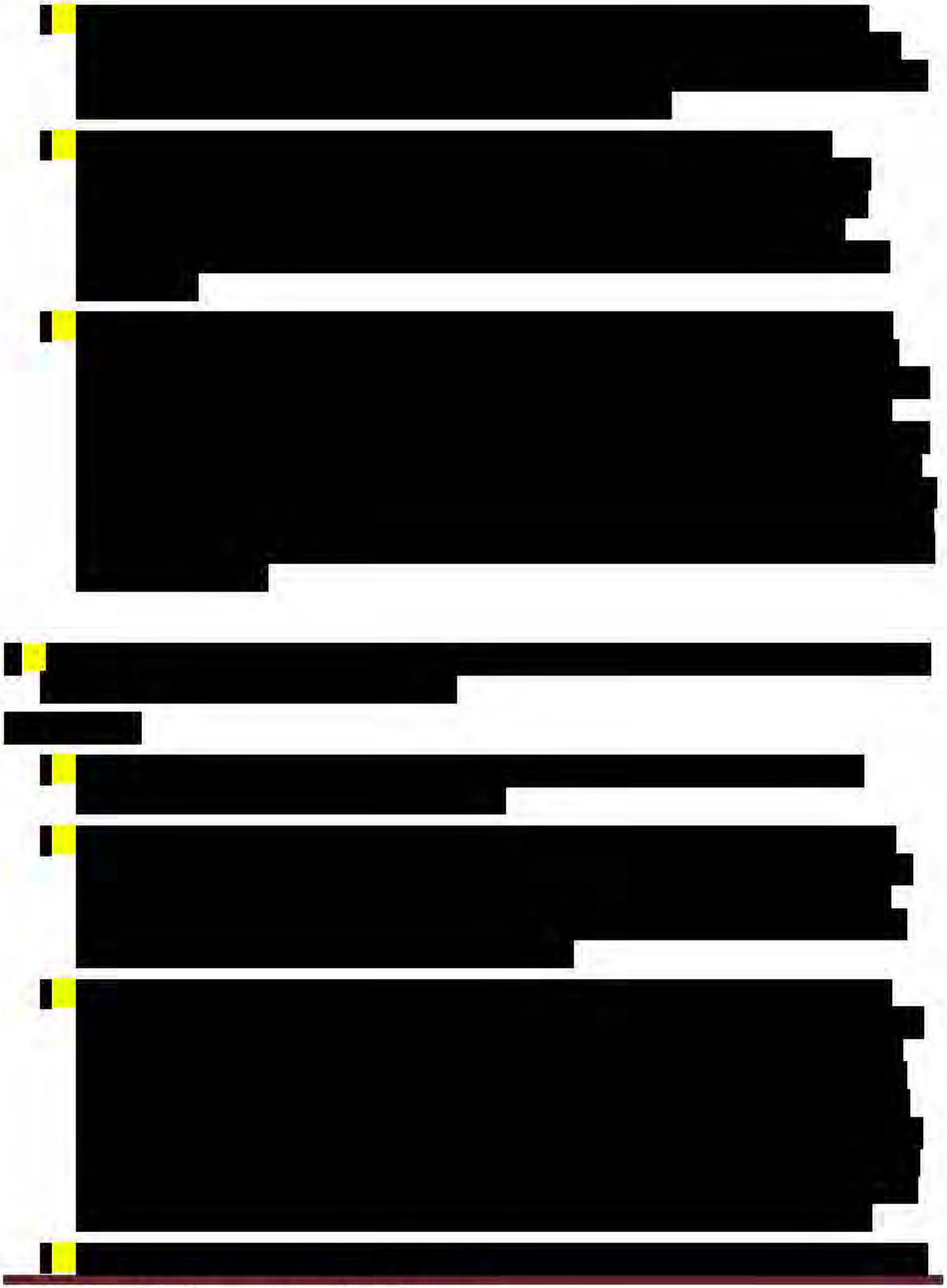

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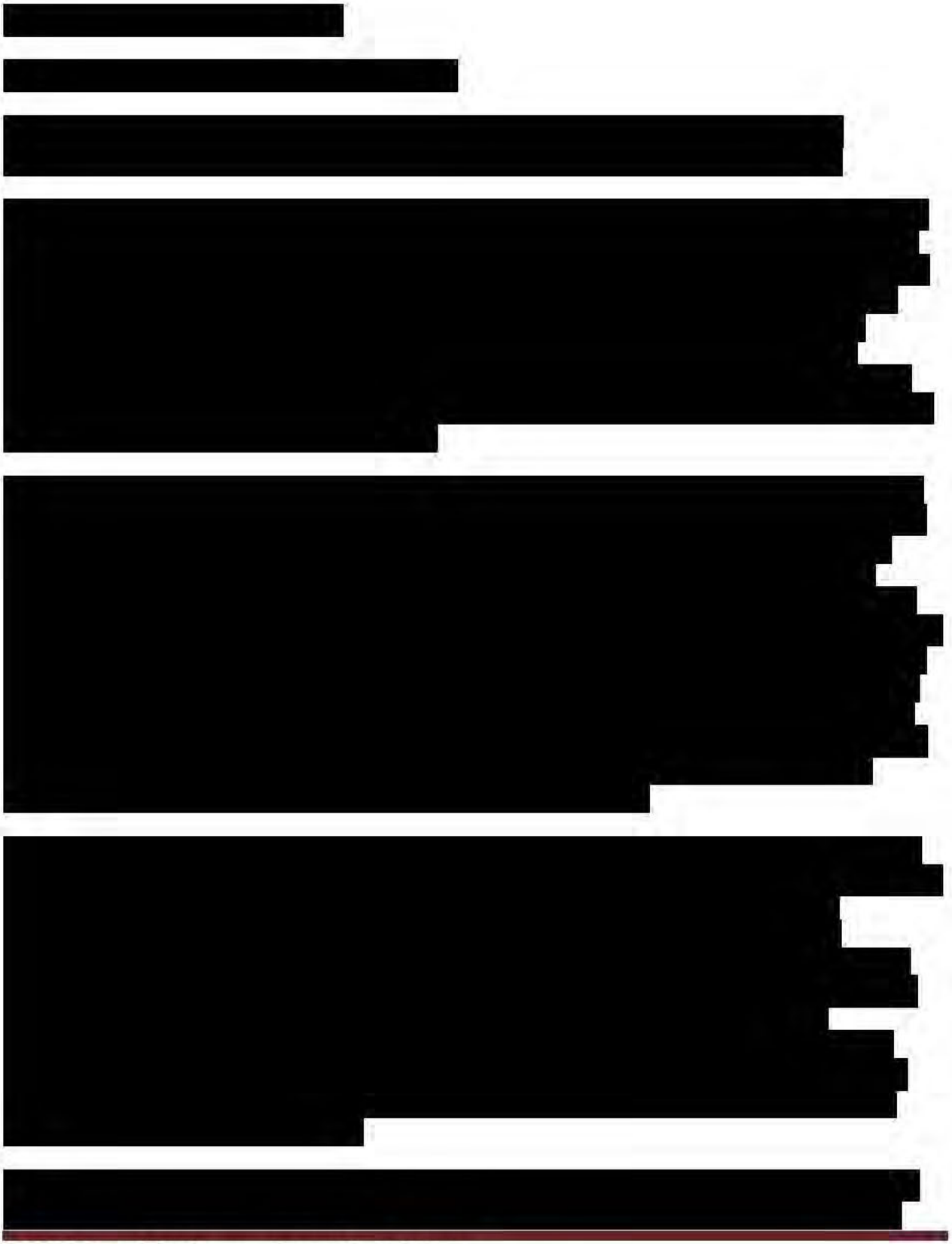

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